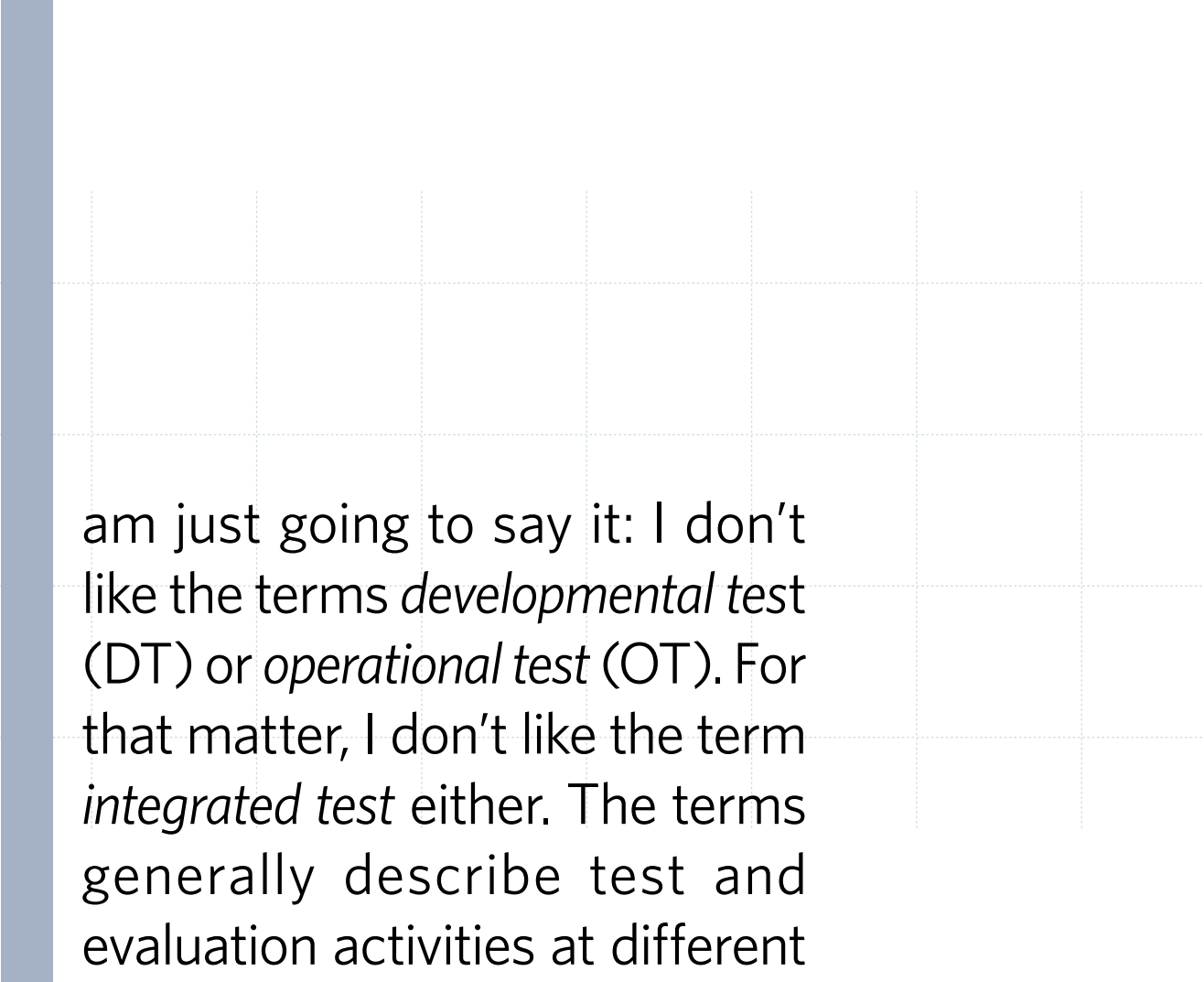




A Capability-Focused T&E Framework

Steven Hutchison



am just going to say it: I don't like the terms *developmental test* (DT) or *operational test* (OT). For that matter, I don't like the term *integrated test* either. The terms generally describe test and evaluation activities at different stages of capability maturity, but they also allude to the different organizations that dictate the terms and conditions of the test—the program manager

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for DT, an operational test agency (OTA) for OT, and some combination of the two to do integrated testing. I guess the reason I don't like the terms is because they represent a *who does what, when* model for T&E instead of a model focused on the capability. I also don't like the terms because the DT/OT model is not complete—there is far more to T&E than DT and OT.

I believe the fundamental purpose of T&E is to enable successful acquisitions of enhanced capabilities for the warfighter. I've chosen those words carefully.

T&E is an enabling process. It is not a question of who does what, but a question of so what?—that is, once the test is done, regardless of by whom, are we confident that the new capability will improve something for the warfighters? To be an enabler in acquisition, we need a model for T&E that is holistic, in which every test event is a shared resource of all stakeholders, regardless of when it occurs, with one purpose in mind: To answer the so what question. Our model must de-emphasize the who and emphasize the what. The following paragraphs discuss a way to get there from here.

A Rice Bowl Environment

First, we need to understand where we are today. Through the course of evolution of the DoD 5000, we have created a multitude of process owners—materiel developer, combat developer, user, tester, decision maker. Today, we are also thinking about capability portfolio managers, although their role in the acquisition process has yet to be determined. Suffice it to say that in the course of creating the acquisition process, we have built a complex environment of rice bowls (meaning a person's small part of a bigger process) and process ownership. And in some cases, process owners staunchly protect their rice bowl.

Moreover, when the department merged acquisition of automated information systems into DoD 5000 in 1996, we added more process owners, such as the interoperability certifier and the designated approving authority (information assurance certifier). (From 1978 to 1996, DoD managed acquisition of AIS under DoD 7920 and 8120 directives and instructions. The 1996 issuance of the DoD 5000 consolidated weapons and AIS acquisitions.) However, we did not

fully define their role in acquisition decision making. For example, the process owners for interoperability and information assurance, the Joint Staff J6, and DAA respectively, do not sign the T&E master plan, even though they are principal customers of significant T&E activities. And when it comes to a fielding decision, the milestone decision authority can make a decision to buy capabilities for fielding to the enterprise, but the DAA can deny operations of that capability on the local network.

The traditional approach to developing a T&E strategy for an acquisition program is to knit together a series of test events that we generally describe as either DT or OT (live fire T&E is not addressed in this article). In doing so, we tacitly assign responsibility for those events to their respective process owners—the PM plans and conducts DT; an OTA is responsible for OT. Somewhere in the mix, we add interoperability and information assurance test events, and responsibility for those activities is thereafter delegated to their process owners. Once the many parties agree to the strategy, the process owners move off to their respective corners and plan their events, and coordination between them is minimal if it occurs at all. This is a worst-case scenario, of course; not all programs experience this.

Recent policy revisions attempt to influence and improve the coordination between the process owners, by blending DT and OT into an integrated testing model that is seamless throughout a system's life cycle (see Memorandum, Subject: Test and Evaluation Policy Revisions, DOT&E and AT&L, Dec. 22, 2007). The new policy does not specifically identify interoperability testing and information assurance as part of the integrated test model, but an integrated model is not complete without them. At its core, however, integrated testing is fundamentally a call for early involvement to bring the government's testers forward in the acquisition process. In the words of the new policy, "T&E expertise must be brought to bear at the beginning of the system life cycle..." This is based on the theory that early involvement of the testers leads to early problem discovery and correction, and therefore the program is more likely to successfully negotiate the acquisition process and achieve a fielding decision.

Early involvement has been a consistent theme in T&E in the department for decades. So why is it so hard to come by? The answer is a bit of a blinding flash of the obvious: Because we made it this way.

The Myth of Early Involvement

There is a saying that a picture is worth a thousand words. Unfortunately, even though I'm using pictures, this paper will not be thousands of words shorter.

Figure 1 is a picture of the Defense Acquisition Management Framework taken from the DoD Instruction 5000.2. Observe how the graphic con-

Figure 1: The Defense Acquisition Management Framework

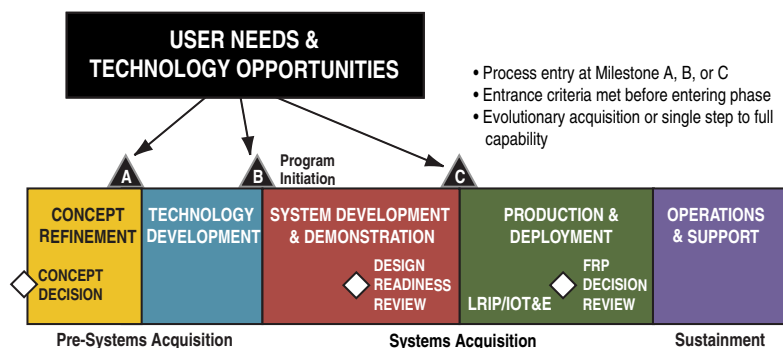
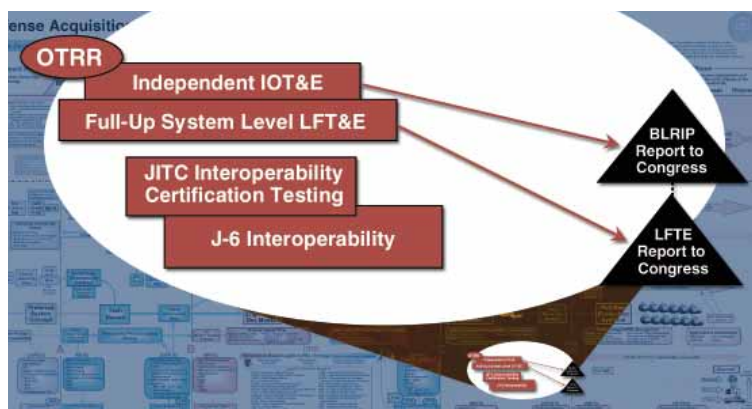


Figure 2: **IOT&E in the Acquisition Process**



veys the relationship of T&E to the acquisition process: one test—the initial operational T&E (IOT&E)—post Milestone C! This is not a very complete picture of the role of T&E, and certainly not one that depicts early involvement.

An equally familiar and far more detailed view of the acquisition process can be seen in the “Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management Framework Chart,” or more commonly called the “wall chart.” (Go to <<https://acc.dau.mil/IFC/index.htm>> for a complete view of the wall chart.) Finding T&E in this wall chart is a bit like looking at a *Where’s Waldo?* picture book. The one test event that is so prominent in the first figure is here as well; it’s just hard to find. Figure 2 zooms in to show the IOT&E.

Now, given this greater detail, look at how we illustrate the IOT&E in the acquisition process: the output feeds a critical report, which in turn feeds a decision event, but—do you see it?—there are no inputs!

The thousand words described by these pictures can be summarized in these few: Testers are not involved early, and what happens in the development phase has no bearing on the IOT&E. Note that it says the same thing about interoperability testing as well. That is, of course, not the way it is in the real world; I’m just trying to shed light on the myth of early involvement.

A closer inspection of the wall chart, however, reveals seven different T&E activities (not including live fire T&E or the military utility assessment associated with the advanced concept technology demonstrations). Figure 3 zooms in to show these seven activities. Observe that T&E activities do not begin until the latter

part of the system demonstration phase—again, not what we consider early involvement.

Our pictures need to tell a different story. More importantly, our DoD directives and instructions need to tell a different story.

The Reality of Early Involvement

If the measure of our early involvement were the number of programs found effective and suitable today, I’d say we’ve been found wanting as an enabler of successful acquisitions.

There is a very basic explanation for why we have such trouble with early involvement and integrated testing: Because we don’t have to. The DoDI 5000.2 creates these rice bowls and assigns their process owners. For example, in the May 2003 version of 5000.2, paragraph E5.1.2 says, “The PM shall design DT&E objectives appropriate to each phase and

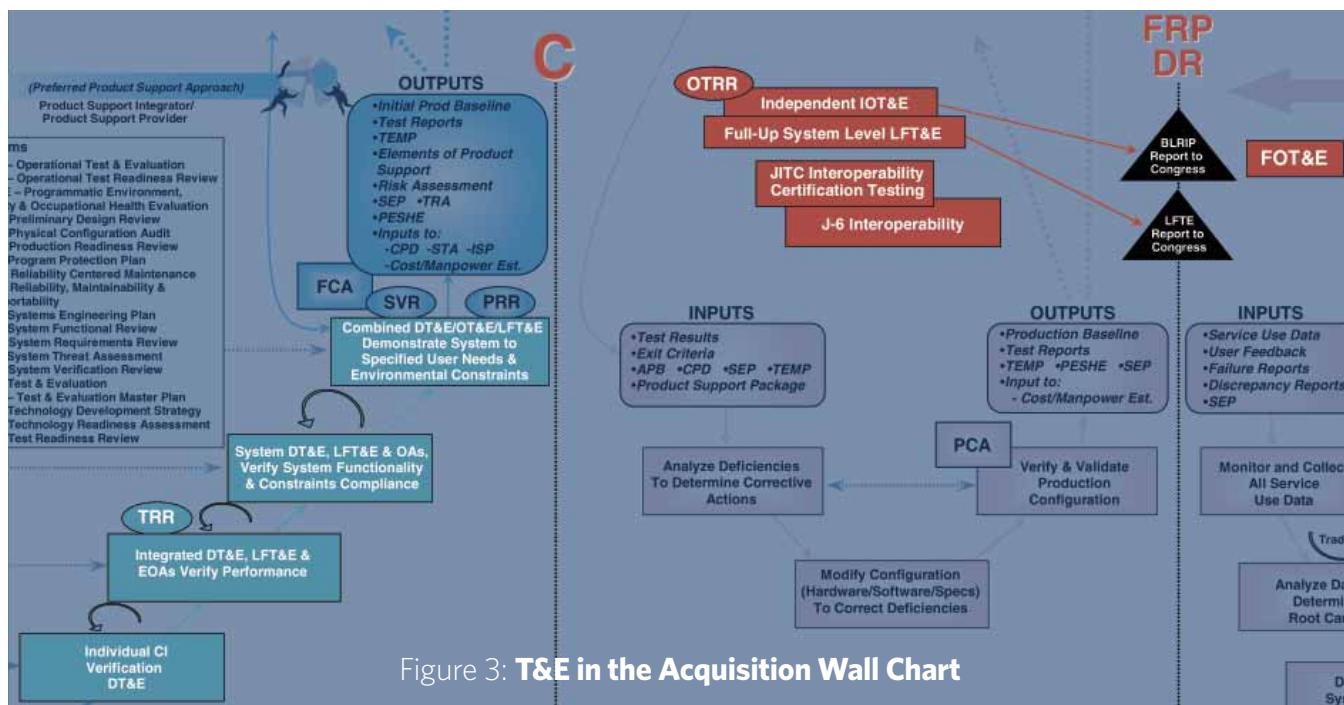


Figure 3: **T&E in the Acquisition Wall Chart**

We wrote an acquisition model that fosters an environment of process owners who protect rice bowls. But since we wrote the model, we can rewrite it.

milestone of an acquisition program. ... The OTA shall design OT&E objectives ...”

Those statements make it clear who owns DT and who owns OT. A subtle change occurred, however, in the revisions currently proposed to the 5000.02. At the time of this writing, the final draft of the 5000.02, paragraph E5.3, uses the following wording: “The PM shall design DT&E objectives appropriate to each phase and milestone of an acquisition program. ... The OTA *and the PM* shall collaboratively design OT&E objectives [emphasis added] ...”

Isn't it interesting that collaboration between the PM and OTA is indicated for OT&E, but not for DT&E? The main

tenet of integrated testing is to get the OTA involved in DT, so we still have not accomplished the change that is needed. A little further in Enclosure 5 (May 2003 version) are the paragraphs E5.1.5 and E5.1.7, which have the following paragraph headers:

- “E5.1.5 Developmental Test and Evaluation (DT&E). During DT&E, the materiel developer shall ...”
- “E5.1.7 Operational Test and Evaluation (OT&E).”

Again we see the 5000 delineating responsibility, especially in the case of DT. Reading through the sub-paragraphs, it is clear that integrated testing is neither expected nor encouraged. Nowhere within E5.1.5 or E5.1.7 are instructions requiring coordination between the materiel developer and the OTA. Interestingly, subparagraph E5.1.5.8. does instruct the materiel developer to “support the DoD Information Technology Security Certification and Accreditation Process [DITSCAP] and Joint Interoperability Certification process” during DT&E.

The new version of the 5000.02 is fundamentally unchanged with regard to the content of these paragraphs. That’s disappointing, especially given the recent emphasis on integrated testing. One might have expected instructions for materiel developers to consider OTA input in developmental test designs and allowing OTAs to collect data during DT. At the extreme, one might expect to eliminate the paragraphs on DT and OT altogether and substitute them with a single paragraph on integrated testing.

That’s the blinding flash of the obvious—we wrote an acquisition model that fosters an environment of process owners who protect rice bowls. But since we wrote the model, we can rewrite it.

Figure 4: **Test and Evaluation in the DoD Acquisition process**

Activity	Test Agent	Conditions	Customer	Reference
DT&E	PMO/contractor/ government DT organization	As determined by PMO; generally benign; lab, developer personnel	PMO	DOD 5000
OT&E	Independent OTA	“operationally realistic ... typical users”	MDA	Title 10, DoD 5000
Joint Interoperability Test Certification	JITC	“applicable capability environments”	J6	DoDD4630.5, DoDI4630.08, CJCSI 6212.01D
IA Certification and Accreditation* (Security T&E) (DIACAP)	OTA, DIA, FSO, NSA	Operational, lab	DAA	DoDI8510.01 * Note also the DOT&E policy on testing IA during OT&E. DIACAP C&A does not complete the requirement for IA testing

Different Terminology
We have a lot of different terms for the types of T&E we do, but not many of them have universally accepted definitions. Depending on where you look, you can find different definitions for most of our common terms. For example, even the term operational testing, which has the widely accepted definition given in Title 10, §139, differs in Joint Publication 1-02, the *Department of Defense Dictionary of Military and Associated Terms*.

A quick check of the *Glossary of Defense Acquisition Terms* and the *Test and Evaluation Management Guidebook* shows that some of

our most common T&E terms—like DT, IOT&E, and follow-on OT&E—are all defined differently to some degree. And despite the fact that we have been talking about integrated testing for decades, neither of those sources provide a definition of the term.

On April 25, 2008, the director for operational test and evaluation and the deputy under secretary of defense for acquisition and technology provided a definition of integrated testing: “Integrated testing is the collaborative planning and collaborative execution of test phases and events to provide shared data in support of independent analysis, evaluation, and reporting by all stakeholders, particularly the developmental (both contractor and government) and operational test and evaluation communities.”

There are three key elements to this definition: collaboration, shared data, and involvement of all stakeholders. For most systems in the acquisition pipeline today, there is an information technology element, be it software, hardware, or communications. Integrated testing gets harder when T&E for information technology is part of the equation. When do we do the information assurance and interoperability tests? Under what conditions? Who can do the testing? Who is the customer? Organizations other than the PM and operational test authority may have to be brought in to perform the tests: the Joint Interoperability Test Command for the joint interoperability certification; and for the information assurance certification, the program might have to bring in a security tester, such as the National Security Agency or Defense Intelligence Agency.

Note the use of terminology on the acquisition wall chart:

- Individual CI [*Configuration Item*] Verification DT&E
- Integrated DT&E, LFT&E [*live fire test and evaluation*], and EOAs [*early operational assessment*]
- System DT&E, LFT&E, and OAs
- Combined DT&E/OT&E/LFT&E
- Independent IOT&E
- JITC Interoperability Certification Testing
- FOT&E.

It is hard to find definitions of all of these terms. However, an important characteristic of the terms is that they reflect a progression from testing individual components to the integrated system, as well as increasing operational realism—from EOAs to OAs to OT&E. That type of progression is a good thing, but with all this emphasis on integrated testing, the terminology might need work. And of course, as depicted on the wall chart, T&E starts late in the game—early involvement should move most of the T&E activities shown in Figure 4 into technology development and system integration. Also, the way the picture tells it, interoperability testing is not part of the integrated test model, and it’s noteworthy that information assurance certification testing is not on the chart (there are references to DITSCAP certifications on the back of the wall chart; the Defense Information Assurance

Certification and Accreditation Program has since replaced the DITSCAP). We need a complete picture.

The question is how to create a framework for T&E in DoD that combines all of the elements described above into a more efficient and effective process. I propose a new model that will do that—I call it the Capability Test and Evaluation Model.

Capability Test and Evaluation Model

A common trend in DoD is to talk in terms of capabilities: the term *requirements* is out, and *capabilities* is in; the term *threat-based* is out, and *capability-based* is in. Moreover, we now hear about capability portfolios and joint capability areas. Hence the name Capability Test and Evaluation, or CT&E.

The intent of the CT&E Model is to:

- Share information
- Improve risk management
- Eliminate duplication and reduce cost
- Conduct comprehensive, mission-focused test events, faster
- Ensure decision makers and users have all relevant information to better understand capabilities and limitations.

In other words, the intent of CT&E is to enable rapid acquisition of enhanced capabilities for the warfighter.

We must recognize that T&E is a continuous process throughout the program life cycle, not just one event occurring after Milestone C. Multiple process owners conduct T&E. However, because we do not have one organization that is ultimately in charge of all of these T&E activities, we foster an environment of serial events, multiple reports, and incomplete information to decision makers.

Capability T&E is all about unity of effort. But to achieve this unity of effort, we need unity of command—a good military phrase meaning somebody has to be in charge. There are at least four different test/certification activities on the road to a fielding decision—different tests, for different customers, conducted under different conditions, and under different rules. Figure 4 depicts the relevant T&E and certification activities that occur in the acquisition process.

Capability T&E brings the four test/certification activities into each test event, beginning as early in the acquisition process as practical. The CT&E model can therefore be described as one team, one set of conditions, every time. The objective of CT&E is to satisfy the decision-making needs of all test customers. CT&E test designs are risk-based, mission-focused. Typical users exercise the capability during the test. A capability test team plans and conducts the CT&E Model, and ideally, prepares one report for submission to all customers. CT&E in no way limits the independence of the OTA or its ability to provide independent, objective evalua-

FROM OUR READERS

Some Additional Rules

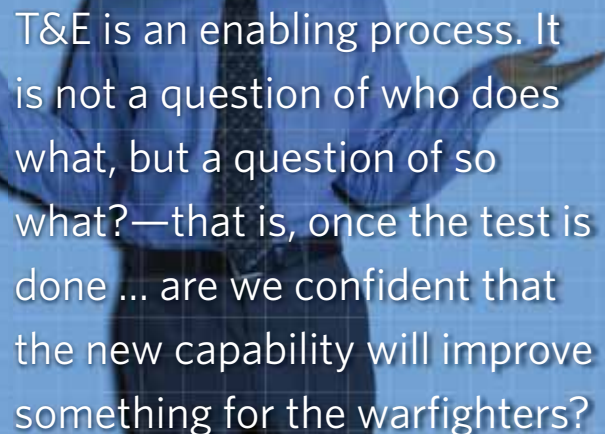
I liked Wayne Turk's article "Step up to the Podium" in the September-October 2008 issue of *Defense AT&L* magazine. It presented many practical tips for preparing, crafting and giving an effective presentation, and preventing the dreaded "PowerPoint® Poisoning" that is so common these days. I plan to distribute the article to all the members in my division as a guide for when they need to make a presentation.

I would like to suggest another technique for effective presentations. A lot of benefit can be realized with pre-briefs of meeting participants before the actual presentation is given. Pre-briefs and offline meetings allow a lot of peer review prior to the formal presentation. It's a good opportunity to get early feedback to be able to tweak the presentation and avoid dropping any bombshells at the actual meeting. We do this routinely here at Naval Air Systems Command. A pre-brief also allows people to concentrate more fully at the actual presentation because it's not the first time they've seen it and they don't have to so many questions.

I also liked Brian J. Duddy's article "To Boldly Go ... Into Defense Acquisition: The Program Manager's Rules Of Acquisition" in the September-October 2008 issue of *Defense AT&L* magazine. The Star Trek theme was an entertaining way to effectively present important information. I liked the rules the author cited, especially the ones about clarity in the statement of work. And I agree whole-heartedly that verbal agreements aren't enough.

I would like to suggest that formal contract modifications aren't always necessary. Naval Air Systems Command routinely holds technical interchange meetings, and the minutes from these meetings provide the written agreements about changes that are made. Minutes are rarely, if ever, disputed, and are a much easier, cheaper, and faster mechanism than a formal contract modification to document changes. Also, making every agreement a contract modification can present a significant workload increase for our contracts department. We usually reserve contract modifications for when there is a change that involves money or a change in scope of the contract.

Al Kaniss
Naval Air Systems Command



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tions of capability effectiveness and suitability. The conditions for test should replicate the joint mission environment and leverage distributed live, virtual, and constructive T&E capabilities to the maximum extent possible.

The *Defense Acquisition Guidebook* says that the milestone decision authority should designate the lead operational test agency to coordinate all operational test and evaluation. The lead operational test agency should produce a single operational effectiveness and suitability report for the program. (DAG, paragraph 11.1.2.2.)

Let's change the DAG to read, "The milestone decision authority should designate a responsible test organization to coordinate all test, evaluation, and certification activities. At the conclusion of each test activity, the responsible test organization should produce a single capability evaluation report for submission to the MDA, the Joint Staff (for interoperability certification), and the DAA (for information assurance certification)."

In the next round of updates to the DoD 5000, let's eliminate the rice bowls and focus on the capability being proposed for fielding to our warfighters.

Making Integrated Testing a Reality

Every test event should be considered a shared resource. Integrated testing is not just about early involvement; it's about sharing information to improve our understanding of capabilities and limitations. As a shared resource, every stakeholder should have some say in how the event is constructed so it satisfies some part of their needs. To be successful at integrated testing will require some non-traditional thinking and the breaking of those rice bowls. Moreover, integrated testing is not just a matter of saying it; we have to teach it, train it, demand it, plan it, and practice it. So let's get on with it.

The author welcomes comments and questions and can be contacted at steven.hutchison@disa.mil.